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ESSAYS

ON

The Female Economy.

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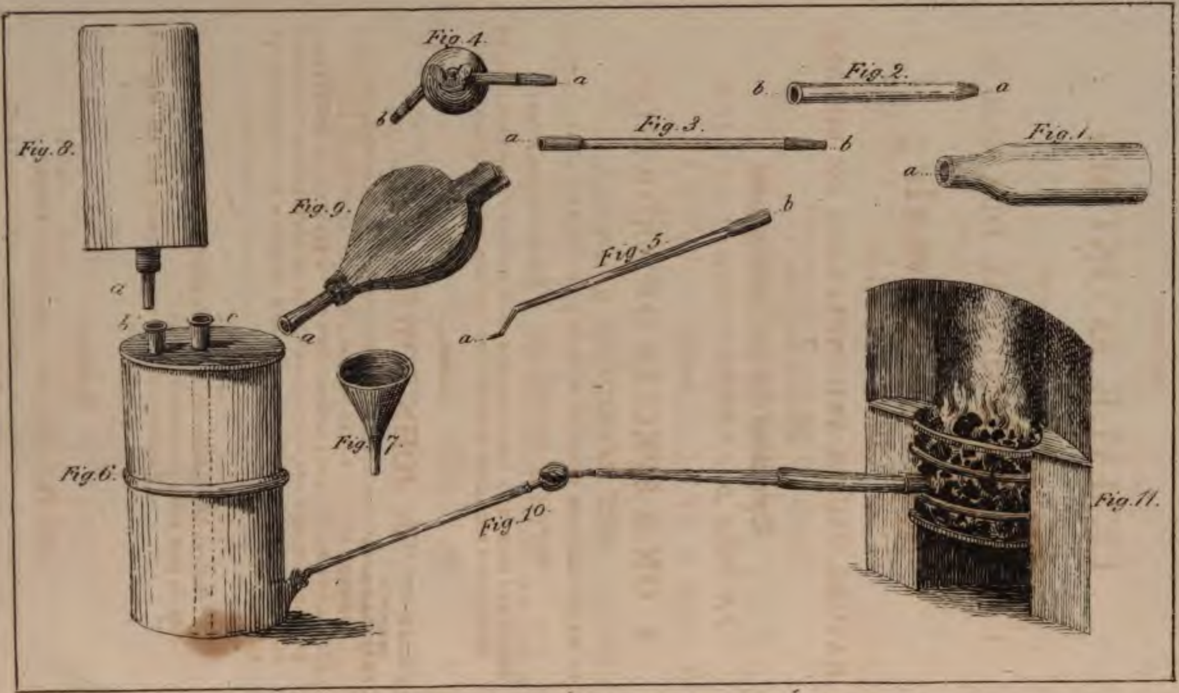

Apparatus for procuring & administering Oxygen Gas for Medical purposes.

C. Hullmandel's Lithography

ESSAYS
ON THE
FEMALE ECONOMY.

1. ON THE PERIODICAL DISCHARGE
OF THE
Human Female;
WITH NEW VIEWS OF ITS
NATURE, CAUSES, AND INFLUENCE ON DISEASE;
TO WHICH ARE ADDED,
Directions for its Management
IN THE DIFFERENT STAGES OF LIFE.

2. ON A SPECIES OF ABORTION,
NOT HERETOFORE DESCRIBED,
TO WHICH DELICATE FEMALES IN HIGH LIFE ARE PECULIARLY LIABLE;
WITH A MODE OF TREATMENT
WHICH HAS SECURED A HAPPY TERMINATION OF THE PREGNANCY, WHERE PREVIOUSLY REPEATED DISAPPOINTMENT HAD BEEN EXPERIENCED.

By JOHN POWER, M.D.
PHYSICIAN-ACCOUCHEUR TO THE WESTMINSTER LYING-IN INSTITUTION; MEMBER OF THE ROYAL MEDICAL SOCIETY OF EDINBURGH; LECTURER ON MIDWIFERY; AND AUTHOR OF "A TREATISE ON MIDWIFERY, DEVELOPING NEW PRINCIPLES WHICH TEND MATERIALLY TO LESSEN THE SUFFERINGS OF THE PATIENT, AND SHORTEN THE DURATION OF LABOUR, &c. &c.

> *"Rationi fides adhibenda, si quæ demonstrantur, conveniunt cum iis quæ sensu percipiuntur rebus."*
> ARISTOT. DE GENERAT. ANIMAL. Lib. III. Cap. 10.

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1821.

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TO

JOHN POWER, M. D.

OF

THE CITY OF LICHFIELD,

THE PRESENT WORK

IS INSCRIBED,

WITH EVERY FEELING OF GRATITUDE

AND

FILIAL DUTY,

BY

THE AUTHOR.

Preface.

THE Author avails himself of the opportunity of his Preface to explain the motives which have induced him to submit the present work to public notice.

The first Essay comprises an attempt to unfold, upon natural and consistent principles, deduced from a consideration of the generative actions, the nature of the extraordinary periodical phenomenon, which characterises the human female, and which, although it has attracted the marked attention of physiologists in all ages, has hitherto received no satisfactory elucidation.

He does not, however, presume to flatter himself, that the view which he has taken, notwithstanding it appears to be well supported by many well established facts, will be deemed to afford a perfect and unobjectionable explication; before this could be admitted, he is aware that a better intelligence must be gained of the nature of the generative, and more particularly of the ovarian, actions.

A comparison of the menstrual actions under civilized and uncivilized states of human society, would probably lead to interesting results as explanatory of the subject; but in this respect the requisite information could not be expected to be readily acquired, since the natural delicacy of female feeling, under, even the least refined state of society, would prevent the mere naturalist, *en passant*, from gaining such acquaintance with the subject as could, with any certainty, be depended upon.

Could these points be satisfactorily ascertained, it would probably be found that the more remote any individual state of society was placed from moral and political habits, and the various causes which are capable of interfering with the actions of nature, the less frequent would be the occurrence of the menstrual phenomenon, and that, in some instances, it might be wholly unknown or nearly so. It may be a matter of question, whether we are to refer to this source, the reported accounts of certain tribes in the Brazils,* and in India, being totally exempt from it.

The sketches which the Author offers of the diseases connected with menstruation, are to be looked upon as mere outlines, which may form the basis of a more extended consideration; nor does he, in this respect, lay claim to originality, except that some few features are brought forward, which are influenced by the peculiar views taken of the nature of the process.

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* Gault: Charleton de Causis Catamen;—*Cap.* 4, *p*. 39.

In the succeeding Essay, his object is to call the attention of the profession to a Species of Abortion, which, not having found noticed or alluded to, in the works of any author he has had the opportunity of consulting, he is disposed to believe, is now for the first time pointed out.

As this affection appears to be of not unfrequent occurrence, and, more particularly incidental to ladies in high life, to whom it may be a matter of the utmost importance to have children, although not exclusively confined to them; and as, when it has once taken place in any individual, it is liable to recur in all future pregnancies, it is hoped that the explanation which is attempted of its nature, and which appears to lead to a successful mode of practice, will not be deemed unacceptable to the profession, or useless to the public at large.

3, *Queen's Square, Westminster,*
25*th June,* 1821.

ERRATUM.

Page 24, line 3, for *unspissated*, read *inspissated.*

AN
ESSAY, &c.

CHAP. I.

ON THE
NATURE AND CAUSES OF MENSTRUATION.

SHORTLY after the period of Puberty becomes established, indicated by changes in her form and character, a peculiar phenomenon makes its appearance in the Human Female, which is termed *Menstruation*, and which consists in the discharge of a fluid from the generative parts.

This fluid, which, in consequence of its colour and other supposed qualities, was formerly imagined of the nature of blood, is now universally admitted to be a peculiar secretion, decidedly differing from the sanguineous fluid, and possessing qualities exclusively its own. In its more usual appearance it is of a red colour; of a homogeneous nature; after being discharged from the body it does not coagulate, but, its fluid parts being evaporated, becomes an uniform spissated substance.

The above fluid is secreted from the cavity of the Uterus, by the mouths of arteries expanded upon its internal membrane, in a manner analogous with the effusions from secreting membranes in general.

When this secretion, which has been named the menstrual discharge, takes place, it continues to be effused without interruption for a space of time, occupying generally from two to five or six days, after which it ceases; this constitutes what is called a term, or period, of menstruation.

The space of one lunar month, whence its name has been derived, is commonly observed to intervene between the commencement of two successive terms of menstruation.

The discharge once established, unless the female becomes pregnant, is suckling, or falls into disease, recurs at intervals throughout a considerable portion of her subsequent life, and particularly that part in which she is capable of performing the generative functions.

Menstruation is to be considered as always interrupted when conception is accomplished, as also for a time after parturition, while the female is naturally and necessarily occupied in the task of suckling her offspring.

This peculiar action is to be regarded as exclusively confined to the human female, or at farthest, to such females as in the structure of their uterine systems approximate more closely to that of mankind, as of the monkey tribe, and which have been said, when subjected to confinement, to evidence appearances of a similar periodical discharge.*

There is reason to think, that the connexion of the ovum to the uterus, and the establishment of the placenta, is, in these instances, effected through the medium of a deciduous membrane, or in a manner analogous with the same in the human female.†

Various views have been taken of the causes of so extraordinary a phenomenon, which it is proposed only briefly to consider, since none of them appear to afford an approach to that satisfactory explanation, which physiological truth demands.

The causes of menstruation have been arranged under two heads; the *efficient* and *final* causes. By the efficient cause is implied that series of bodily or physical actions which gives rise to the discharge. The final cause comprehends its *use*, or the *purpose* which it serves in the female economy. In both respects, an infinity of conjectures, the offsprings of hypothesis, have hitherto supplied the place of rational demonstration; and the real explanation has appeared, like the gordian knot, to admit rather of forcible separation, than a true and systematic unravelment. In the present day of scientific enquiry, however, the method of reasoning from established fact, and fair induction, has effected much towards banishing the unnatural chimeras of imagination; and it is to be hoped that the light of truth will eventually be enabled to penetrate into the more secret, and hitherto unexplored, recesses of Nature.

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* See Buffon on the Monkey Tribe *passim*, and the works of John Hunter.

† "The monkey differs from other animals, in having no permanent papillæ; but the maternal part of the placenta is deciduous, like that of women."—*Burns*, *p.* 146

In conducting an enquiry into the present subject, it is intended, in the first place, to take a brief view of the opinions which have been entertained with respect to it; and, afterwards, to offer a novel explanation, which, however erroneous it may be deemed, has, at least, strong fact and analogy to support it.

It is scarcely to be wondered at, when philosophers were so constantly accustomed to refer the more important actions of the human system, whether under a healthy or diseased state, to the effects of planetary influence, that menstruation, which observed so correctly the period of a revolution of one of the heavenly bodies, should have been attributed to that source. We consequently find lunar attraction advanced as an efficient cause of the phenomenon. This opinion, which is as old as Aristotle, and has been particularly advocated by Erasistratus and Dr. Mead, was for many ages regarded, as affording a true explanation. Its falsity is, however, easily demonstrated, since, admitting it to be true, the time of menstruation would correspond with the moon's phases; the real fact is, however, very different, and it is certain that the action takes place, at all times indifferently, and at all ages of the moon, so that numbers of women are at all instants undergoing the process of menstruation;

nor is the lunar period the regular menstrual period, as some women menstruate every three weeks, and in others, the discharge is protracted for six weeks; whereas, was lunar influence the cause, it would uniformly produce its effect at the same period in all women; therefore, the coincidence must be regarded as accidental.

The discharge has also been supposed to be produced by a plethoric state of the system, a larger generation of blood being imagined to take place, to provide for the necessities of utero-gestation and the growth of the fœtus. Was this true, why do not all females manifest the same effects? why is menstruation confined to the human species, since the same necessities exist in every other animal? Nor can any evidence be adduced that the system is more plethoric at the period of menstruation; was it actually so, the abstraction of a considerable quantity of blood, immediately before the discharge is expected, ought to prevent it; this, however, we know it will not do. It cannot, therefore, be considered as depending on redundancy of blood.

It is urged by some that the plethora is local. If by local plethora is meant increased vascular action of the uterine system, it is admitted that such does exist, and influences menstruation; but this alone is insufficient, as the same state of the uterine system occurs in other animals, without producing that effect.

Others have supposed a peculiar *ferment* in the uterus: this explanation is vague and unintelligible, as not the least proof can be adduced of the existence of any fermenting process.

Various opinions have also been entertained respecting the final causes or purposes to be answered by the discharge; of which the following are the more credible ones.

1. It has been imagined, that the menstrual fluid was intended to furnish the nutriment of the fœtus. This is disproved by various arguments. There do not appear any reservoirs in the womb, in which the fluid can be collected to answer this intention. When conception first takes place, the embryo is too small to consume the quantity of obstructed menstrual fluid which would otherwise have been discharged; on the contrary, at the latter periods of pregnancy, the relative proportion of fluid appears too small. Nor is there any appearance of such a provision for the nutriment of other animals. Had there, as Dr. Denman observes, "been a gradual abatement in the discharge, in proportion to the increase of the fœtus, its nourishment might have been presumed to be one of the final causes of menstruation."

2. A second opinion, and which is very correspondent with the previous one, is, that it is intended to habituate the body to the generation of more blood than is necessary for its sole support, in order that a sufficient supply may be ready for the exigencies of the fœtus. In reply to this, the same arguments which have been urged against the former opinion

might be repeated, since the demand from the mother during the early periods of pregnancy, is too small to make such means of supply requisite. If correct, it may be conceived that the principle would be more necessary in those animals in whom generation proceeds with increased rapidity, than in the human female; as in sheep, dogs, rabbits, &c. yet menstruation is entirely wanting in these latter animals.

3. It is conceived that it is intended to obviate plethora. This has been before adverted to, with an observation that no proof exists of the menstruating female being in a state of plethora, and that, on the contrary, the discharge will take place immediately after considerable sanguineous evacuations.

4. It has been the more favourite opinion that menstruation serves to keep the uterus in a proper state for conception; an explanation, however, which at most expresses the mere effect of the action, without throwing any light upon its nature. If we admit it, we learn nothing in consequence, and have still to enquire; what is the change produced in the uterine system which renders it capable of discharging its generative functions? The generative function proceeds in every other animal without this phenomenon, and it is by no means proved that it cannot go on properly in the human female without it. It has, indeed, been regarded as the *sine qua non* of pregnancy; and it has been advanced, that women who do not menstruate, or *are not in a state disposed to*

menstruate, do not conceive. Its connexion with the generative process cannot be denied; but it appears, not sufficiently proved, that its occurrence is necessary, to enable the female to conceive. Nothing has been yet advanced to prove that it may not be a link in the *effects,* rather than the *causes* of the generative process; and, in short, that an improvement might be made upon the axiom, that "women who do not menstruate do not conceive," by substituting the following: "a woman menstruates because she does *not* conceive."

It is proposed to consider, how far an explanation offered upon this principle, is supported by facts and rational argument.

In the first place it may be premised, that all animals, with perfect organization, on attaining a certain period of their lives, and which period is to be regarded as their age of puberty, become capable of producing their respective species. This period is indicated by peculiar changes of organization, and the full power of discharging the generative function. An obedience to this, which may be termed a general law of nature, may be considered, in all instances where the natural actions are not contradicted by education, either physical or moral, as certain to be followed by the impregnation of the female. In the lower classes of animals, particularly in those, which are left in the most uninterrupted state of nature, this effect is with little exception invariably produced; the opposing causes being seldom experienced. In the human female, however, the operations of habit, education, moral restraint, and the customs of society, combine to produce most essential deviations from this law, insomuch that the occurrence of pregnancy, by the perversion of custom, is rather looked upon as an accidental than a natural state; so abortive are the generative actions liable to be rendered from such sources. Nevertheless, Nature is true to her principles, however opposed by external circumstance. The human female, notwithstanding the counteraction of the above causes, is so constituted, as to be susceptible of impregnation, from earliest puberty, as various instances have demonstrated;* nay, even before the establishment of the menstrual process. Under such circumstances, the occurrence of the discharge would naturally and necessarily be postponed during the nine months of utero-gestation, and, subsequently, through the period of lactation. As, at the latter part of this maternal function, it is common for the female to conceive again, previous to the re-appearance of menstruation, what is to prevent this repetition of pregnancy, and want of menstruation, throughout the whole period of the capacity for propagation? In this manner a female might go on through a long life, in the fullest discharge of the generative functions, without once menstruating. Nor is this an imaginary case; women have been known to proceed as above described; of which cases may be adduced from respectable authority.* Can it then be said that menstruation is a *necessary action?*

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* Bartholine, Cent. v. Hist. xvii. speaks of a female, who, being married at the age of ten, became a mother at twelve. Savarola has given a history of a girl impregnated at the age of nine. In India it is not uncommon for females to bear children when only ten years old. Manderloo, Hist. Orient. lib. I. c. 89, relates an instance of its taking place in the sixth year.

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* Fabricius, Cent. v. obs. 41, *solemnly* asserts, that he knew a female who never experienced the menses, either before or after her marriage, notwithstanding which she had seven children.

Hildanus, Cent. v. p. 428, gives a similar instance.

Laurentius Joubert, in his Treatise de Populor. Erroribus, lib. ii. mentions a woman of his acquaintance, who had eighteen children without ever menstruating.

Guainerius, Tract de Ægritud. Matricis, speaks of a girl, (adolescentulam), a patient of his, who became pregnant before the appearance of the menses.

Bartholine, Cent. iv. Hist. xxxvii. says, "Novi mulieres quibus ante conceptionem nunquam apparuerunt menses, virginesque nuptas quanquam menstruatæ nunquam fuerant, prole tamen familiam auxisse."

Van Swieten, S. 1284, appeared to be aware of the little necessity for the actual occurrence of the menstrual discharge to admit of pregnancy, so that the internal surface of the uterus was adapted for a proper connexion with the ovum; he says, "Huic aptitudini conducere videtur fluor menstruus, licet etiam parcior fuerit; et in raris casibus observatum, quasdam mulieres, licet nunquam menstruatæ fuerint, fæcundas fuisse;—in raris illis casibus credibile videtur, uteri vasa sic disposita fuisse, ut pervia quidem fuerint, et nexui cum ovo humano apta, sed tamen non adeo patula, ut sanguinem transmittere potuerint."

Were women living in a state of nature, is there not reason to infer that this discharge might be unknown? for supposing, (as that state would operate) that, between the age of 15 and 45, the female was employed in the constant task of renewing her species, one nine months would be employed in producing, and the next nine months in nourishing, her child, so that no time would be left for its occurrence.

It is now proposed to shew, from physiological deduction, that menstruation ought not to be regarded as an absolutely necessary action in human generation; and to make an attempt to point out its real nature.

However varied the process of generation may appear in different classes of animal and vegetable productions, the same general principles operate in all, by which the primary and leading actions, tending to the perpetuation of the species, are regulated; variations from those principles being found in secondary actions only. In the investigation of these general principles, certain important phenomena may be detected, so evident and marked in some, that no doubt can exist that they are equally common to all, although the direct modus operandi may not be manifest. Amongst these, the following may be adduced as the most important, *viz.* the formation of an ovum by the female, which contains certain contributions to the generative process, and requires the co-operation or influence of the male, to determine it to produce a new creature. This ovum, besides comprising whatever the female contributes to the life and organization of the future animal, appears to be provided with a quantity of nutriment for its support, during more or less of the earlier periods of evolution. Besides producing the ovum, the actions of the female have to provide for its extrusion or separation from the ovarium, previous to its reception in the nidus appointed for its future evolution. In those varieties of generation, which have been termed viviparous, from the circumstance of the evolution of the ovum being completed within the maternal system, and thence expelled in a perfected state, the nidus in which that process of evolution is effected, constitutes a part of the generative structure of the female, and is termed the *uterus*, into which the ovum is received soon after impregnation, and to which it becomes subsequently attached. To effect this connexion between the ovum and the uterus, a series of actions are uniformly carried on, and which are conformable to the peculiar structure and constitution of the individual animal.

In oviparous generation, the nidus is external to the maternal system; in this variety, a series of actions of the female, which are to be considered as part of the generative process, will also be found, more or less, called forth, to effect the establishment of the ovum in its proper nidus.

In effecting the generation of a new creature, the male appears to contribute a very limited portion, namely, a part of the life and organization of the new being, derived from the seminal fluid and communicated to the ovum at the time of conception. Here the male actions terminate.

In producing their respective portions or contributions, the male and female sexual systems appear to act independently of each other. In the female, it seems probable that the ovum is formed, and stored with its proper supply of nutritive fluid, and that the preparatory actions for its change from the ovarium to the nidus, are carried into great forwardness, before the time when impregnation becomes necessary; nay, in many instances, the whole of these actions are completed previously. Instances in corroboration of this doctrine will shortly be adduced.

An admission is now claimed of the following leading positions, deduced from the above arguments.

1st. That in every female arrived at her peculiar age of puberty, and in whom the sexual organization is perfect, the generative process proceeds, in a regular and uniform series of progressive actions; to produce an *ovum*, containing whatever principle the female may contribute to the life and structure of the new creature, with nutritive matter to support its vitality and growth, until it is enabled to derive sustentation from sources external to that ovum; and also to prepare for its removal to, and establishment in, its appointed nidus.

2dly. That this production of the female part of the embryo, and the preparation for its support and subsequent evolution, is entirely independent of all influence from the male.

Strong analogies may be adduced from animal and vegetable generation in confirmation of the latter position. In the uterine system of the hen or pullet, the ova are found in every state of forwardness without having been influenced by the male, containing the nutritive yelk and albumen, and possessing its crust, and only differing from perfect eggs, in wanting the prolific contribution of the latter. In the frog, toad, and newt, as demonstrated by Spallanzani, and in fishes, the ova are perfected as far as the female is necessary, without the assistance of the male, impregnation not taking place until they have been actually extruded from her generative organs. In vegetable generation the seed pod or receptaculum, contains the form, rudiment, and embryo, of every future seed, and even of the whole fruit, before the male organ is developed; as is beautifully demonstrated in the cucumber. Abundance of other instances might be adduced.

The above are evidently the effects of a leading principle, which, it is fair to infer, is equally applicable to the human female.

The mode of vivification of the embryo, and of the subsequent process of evolution in each individual, is to be regarded as a secondary and accidental circumstance, influenced by the peculiar structure of the animal—thus, in birds, the ovum is matured by incubation; in fishes, by solar heat and moisture; while, in the viviparous animals, the maturation is effected within the maternal system in a nidus termed the uterus.

But the correct application of the above to the actions of the human female does not rest upon mere analogy. At and subsequent to the time of puberty, the enlarged ovaria are found to contain *ova* in different states of perfection; and in women who have never been impregnated, corpora lutea and cavities, which have been supposed previously to have contained ova, have been detected; whence it may be inferred that in them not only the formation but the extrusion of ova is accomplished, without the influence of the male. So far the analogy appears confirmed by facts, admitting of demonstration, and which will scarcely be called in question It will be attempted to show that menstruation is a farther link in the chain of these progressive actions, when they fail to be determined to conception by the operation of male influence.

It may be asked, whether it is likely that the uterine actions of the mature female should be confined to the ovaria, and consequent production of ova? This is not only improbable, but direct evidence may be advanced to the contrary, as in the sympathetic changes of the mammæ and the general system at the period of puberty, and the increased actions and propensities of the whole of the sexual organs. The uterus in particular enlarges, its vascular action increases, and the phenomenon of menstruation succeeds.

That the actions of the uterus, at the period of puberty, are influenced by the state of the ovaria, and consequent to them, is sanctioned by the highly respectable opinion of Dr. Cullen, who says, "as a certain state of the ovaria in females prepares and disposes them to the exercise of venery, about the very period at which the menses appear; it is to be presumed that, the state of the ovaria and that of the uterine vessels are in some measure, connected together, and as generally symptoms of a change in the former, appear before those of the latter, it may be inferred, that the state of the ovaria has a great share in exciting the actions of the uterine vessels."* It must be a matter of general observation, that the symptoms of puberty precede the menstrual discharge.

The connexion of menstruation with the generative faculty is universally admitted; but the precise nature of that connexion has not been ascertained. It is conceived, that the discharge is an effect of the actions of the uterus preparatory to its reception of the matured ovum, and which are disappointed in consequence of the stimulus of impregnation not being applied.

If menstruation is viewed as an effect of disappointed pregnancy, only occurring in the human female, it necessarily follows, that some peculiar organization, or mode of accomplishing the generative process, must exist in the uterine system of the human subject, which determines it to take on so peculiar an action.

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* Cullen's First Lines, 1001.

Without entering into minute, or even general, anatomical enquiry, it may be noticed, that the human uterus presents a more glandular appearance, and that its connexion with the impregnated ovum is effected in a different manner from what is manifested in any other animal.

This glandular structure of the uterus is to be considered as an evidence of a secreting power being attached to it, and of which menstruation may be regarded as a product. It is not, however, the only product; for we find an apparently different, and probably more important one, taking place at the period when impregnation is effected, *viz.* the secretion of a gelatinous or mucous fluid, which, concreting upon the parietes of the internal cavity of the uterus, forms, what Dr. Hunter has called, the decidua membrane. It is worthy of remark, that these two effects originate from the same structure, and it is probable that their congeniality may be much farther extended.

The connexion of the ovum with the uterus is established as follows:

About the time when impregnation is accomplished, " the blood-vessels of the uterus appear to be enlarged as in a slight degree of inflammation, the internal surface becomes softer and more spongy in its texture, and a white mucus, which has been likened, from the delicacy of its arrangement, to the web of a spider, is secreted; which, gradually assuming a more solid form, and becoming vascular, adheres, or is closely united, to the uterus, to the whole cavity of which it forms a lining, except at the orifices which lead to the fallopian tubes and the os uteri."—"It may be considered as indispensibly requisite for the reception of the ovum—so that if it were to receive a name from its use, it would not be improper to call it the connecting membrane of the ovum."*

The animated ovum being received into the cavity of the uterus, its vessels shoot into this medium, and it acquires thereby, that connexion with the maternal system which enables the embryo to derive the support necessary for its perfect evolution.

Having considered the manner in which the uterine actions are influenced by the impregnated ovum, it becomes necessary to ascertain the deviations or effects produced by a prevention or disappointment in that respect.

In proportion as an ovum acquires a state of maturity in the ovarium, the uterus undergoes a correspondent preparation for its reception. Its vascular action is increased in a degree tending to a state of inflammation, and it wants but the additional stimulus of impregnation to determine it to the production of the deciduous secretion so requisite for its proper connexion with the ovum; if, however, the stimulus of impregnation is denied, this increased action is not carried to a sufficient height to produce properly that effect; nevertheless, it is sufficient to give rise to the effusion of a fluid, *which fluid is the menstrual fluid.* The secreting orifices of the uterine vessels being thus determined to an evacuation of their contents, this proceeds until, the ovarian action ceasing, the irritations of the uterine system are relieved, and the *effects* of the increased local action obviated.

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* Denman, Chap. V. Sec. 5.

The quantity of fluid discharged during menstruation, and the difference in the qualities of that fluid from the decidua membrane, are not to be regarded as objections to this theory.

The open mouths of arterial vessels it is well known will continue their effusion until the increased impetus e tergo by which they are influenced ceases, as is evidenced in catarrh, gonorrhœa, &c. and this will be more particularly the case where the discharge does not partake of a coagulating nature, as is the case in menstruation.

Upon this principle the uterus, being determined to the effusion of the menstrual fluid, by its correspondence with ovarian action, continues that effusion during the continuance of that increased action. As this diminishes, whether in consequence of the relief given by the evacuation, or from the individual mature ovum having lost its influence by the disappointment of its impregnation, or both conjoined, the actions of the uterus diminish with it; menstruation then ceases.

The duration of this period and the quantity of discharge will be necessarily determined by the degree of activity of the individual uterine system, as influenced by habit, constitution, or accidental circumstances.

Nor is the colour of the menstrual fluid to be regarded as an objection to its congeniality with the deciduous membrane. Why the colour of the fluid should resemble that of blood, or why it possesses any other peculiar characteristics, it is as impossible and as unnecessary to explain as the peculiarities of any other secretion. It may be considered as most essentially differing from the deciduous secretion, in wanting the coagulating principle, probably from the uterus, under a minor state of action, not assuming sufficiently the inflammatory diathesis, or an approach to it, to produce the effusion of coagulable lymph. The difference of the menstrual and deciduous production is not more remarkable than the varied appearances which other secreting structure evinces, under various modifications of action; increase the impetus of action, and the quantity of secretion is increased; carry this on to inflammation, and coagulable lymph is poured out, or pus formed. On the contrary, diminish the impetus and the secretion is diminished, and becomes more thin, or serous; relax them, or diminish their tonicity, and they will even pour out red particles.

There is, however, very strong reason to believe, that the difference between the menstrual and deciduous secretions is not always so decided, as on the prima facie view, it appears to be. In women placed out of all improper suspicions, where the local actions of the uterine system are carried to a greater than customary height, the actions of the uterus preparatory for the reception of the ovum, extend to an actual production of the deciduous secretion; so that the menstrual discharge becomes, bonâ fide, a discharge of decidua membrane. This fact, which attracted the attention of both Harvey and Morgagni, but was more paricularly pointed out by Dr. Denman, is evidenced by the discharge of skinny matters, most commonly in detached pieces, but occasionally so perfect as to resemble an ovum, and to be mistaken for a miscarriage, and may be regarded as a decisive proof that the generative actions of the human female, like those of the pullet, are capable of being carried to a considerable extent without the male influence. Does not the above fact afford most powerful evidence of the congeniality of the menstrual and deciduous secretions, if not of their identity? It, indeed, seems scarcely possible to doubt or contradict the identity of this variety of menstruation with the decidua, when the various arguments in its favour are accumulated.

The membranous discharge differs not in appearance, structure, or in the sources from whence it is derived. It is attended by a series of sympathetic actions throughout the whole system, similar to what accompany that period of pregnancy, when the true decidua is formed; it is also expelled by an action exactly the same as characterizes early abortion, so as to be even mistaken for miscarriage; and only differs in the circumstance of the ovum not having experienced impregnation.

This state of membranous menstruation appears very correspondent with the production and extrusion of the unimpregnated egg of the pullet, and is probably the effect of a similar excess of action.*

But it may be objected that this opinion of identity is discountenanced by the fact, that women who are subject to such peculiar menstruation, seldom, if ever, become pregnant; whereas, admitting it to be the consequence of a high disposition to discharge the generative function, conception ought to be more readily accomplished.

That the occurrence of the adventitious membranous discharge does not preclude the possibility of pregnancy, may be proved from Morgagni, and is admitted by various authors of respectability, and I am fully convinced of the same from my own experience in various cases; granting, however, that it has a tendency to impede the functions of generation, it does not appear a difficult matter to reconcile the apparent anomaly.

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* The analogy of the unprolific ovine production of the pullet, with menstruation, did not escape the penetrating mind of Harvey, He says, speaking of this *action*, "Quasi in hujusmodi animalibus, ova concipere perinde foret, ac in puellâ uterum incalescere, menstrua profluere, &c."—*Exercit. de Gener.* 5^{to}.

The uterine actions are influenced by those of the ovaria; in order to a proper discharge of the functions of the former, it is requisite that a due and relative correspondence exist between these two parts of the generative system—that when the ovum is *mature* the uterus should be properly *prepared* for its reception. Any derangement in the equilibrium of this relation will tend to derange the subsequent steps of the process; thus, if the ovum is matured before the uterus is prepared for it, the conception will be rendered abortive, et vice versa, the same effect will ensue if the uterus is too early prepared for the reception of the ovum. In these cases of peculiar menstruation it is conceived, therefore, that an excessive local action of the uterus hurries it prematurely through its actions, while the state of progress of the ovum continues relatively in a minor degree, and incompatible with the correct generative actions.

It may also be conceived that the excessive action of the uterus, analogous with a state of inflammation, extending itself to the fallopian tubes, may render them impervious to the prolific influence of the seminal fluid, and thus impede their proper functions; or that the effused inspissated fluid may obstruct the communication through the body of the uterus itself.

It may be enquired, what becomes of the disappointed ovum? what process does it undergo to remove it from the system? This question involves some of the more intricate and inaccessible points of generation, an attempt at the explication of which must be hypothetical.

It may be presumed from the facts disclosed in ovarian conception, that the impregnation of the ovum takes place in the ovarium. Admitting this, it appears probable that the increased stimulus applied to the ovarium by the animated ovum, at the same time that it operates on the uterus in determining it to its deciduous secretion, produces in the former a state analogous with inflammation and ulceration, in consequence of which the peritonæal coat in contact with the ovum is removed, and the latter allowed to escape and descend through the fallopian tube into the uterus. If the prolific stimulus is denied, the ovarian action may be insufficient for the necessary detachment of the ovum; in this case it is probable that, as an useless structure, it perishes, loses its connexion with the uterine system, becomes an extraneous body, and is, by the process of absorption, removed from the ovarium: or, in some cases, where the constitutional or local actions of the uterine system are excessive, the degree of ovarian action may be sufficient to produce the detachment of the ovum. The corpora lutea found in the virgin ovarium, may be regarded as the cicatrices remaining from the ulceration attendant on this detachment; and the influence of the excessive ovarian action, it is presumed, will be sufficient to account for the formation of the membranous and decidua-like skins in dysmenorrhæa.

It is desirable to enquire how the periodical occurrence of menstruation is to be explained according to the present view.

The generative powers of the human female are not limited to the production of a single ovum; on the contrary, a number may always be detected in the ovaria, under different states of progress. The loss or disappointment of one matured ovum is followed by the maturation of another; this in its turn becomes disappointed, and thus, an indefinite series is carried on throughout the period of generative capacity.

The interval between the maturity of two successive ova will be the interval between two successive periods of menstruation; and as this usually occupies a lunar month, it is reasonable to infer, that such time is required for the preparation or maturity of a second ovum, after the disappointment of a preceding one.

In the human female, it is worthy of notice that the period of puberty once arrived, the generative function continues uninterrupted, until, in the decline of life, it wholly ceases; while in other animals and in vegetables, the powers of reproduction are only developed at certain periods; the sexual system in the intervals, reverting to a state of immaturity. It is possibly, in consequence of this continued orgasm or excitability of the human generative system, that nature had deemed it necessary to relieve the periodical excessive actions, by providing the evacuation of the menstrual discharge.

We shall now recapitulate in a summary way, the opinions which have been above advanced.

As the age of puberty approaches, and long before menstruation is established, the ovarian system of the human female, which had in earlier life lain inert, and almost invisible, begins to develope itself, and experiences that peculiar state of increased action, which determines it to the formation of an ovum, containing the female contribution to the embryo, and a store of nutritious matter for its support in the earlier periods of conception, before its full connexion with the uterus has enabled it to acquire supplies from sources external to itself.

It is, then, necessary that, after receiving the vivifying principle of the male, this ovum should be received into a nidus called the uterus, through the medium of its connexion with which, it derives from the maternal system the remaining nutriment and support, requisite for its full evolution and advancement to perfect animal life.

During, and consentaneous with the above nisus of ovarian action, the uterus, by a correspondence with that action, is undergoing a state of preparation for the reception of the ovum into its cavity, and subsequent connexion with it. For this purpose, the uterus secretes a gelatinous fluid, resembling coagulable lymph, which inspissates, or concretes, into an organized substance, termed the decidua membrane; into this membrane the vessels of the ovum shoot, upon the common principle which affects the union of inflamed parts, and a connexion is established by the formation of a peculiar placental mass between the maternal and fœtal systems.

Was the human female living in a state of nature, it is conceived that the above series of action would necessarily and invariably take place at the period of puberty. It happens, however, that in consequence of the operations of various physical and moral causes her impregnation is prevented, at that time, as well as at different subsequent periods of life. When this occurs, the actions of the generative system proceed, notwithstanding, as far as possible, in the discharge of their respective functions; but wanting the vivifying influence to be derived from the male, do not attain their full and proper acmé; the actions of the uterus in particular, except in certain cases of excessive local action, are insufficient for the formation of the decidua membrane; nevertheless, they are carried to a sufficient height to produce the effusion of a fluid from the secreting orifices; which fluid is the menstrual discharge.

The uterine system is relieved by this discharge from its high state of local action, until the maturation and disappointment of another ovum, reproduces the phenomenon.

Under this view of the subject, the efficient cause of menstruation may be defined—"An imperfect or disappointed action of the uterus in the formation of the membrane, (decidua), which is requisite for its connexion with the impregnated ovum."

With regard to the final cause, it may be conceived that, looking upon the discharge as a deviation from what are to be considered the natural actions of the female, nature could have no final end in view, as it would be absurd to suppose an end contemplated, where no natural efficient cause was provided. Nevertheless, some anatomical evidence may be adduced, which proves that the efficient cause, whether natural or unnatural, was foreseen, if not intended. How otherwise is the perforated hymen to be accounted for? the aperture of which appears evidently calculated for the transmission of the menstrual fluid.

The hymen itself, which is peculiar to the human female, has, without doubt, some relation to her moral state, and may be considered as an evidence that the wise Creator intended to place restraints on the sexual passions of the human race, and their consequences, and is a fine illustration of the difference of its relations with its beneficent author, from those of the inferior animals. Our moral and religious duties are not unfrequently at variance with the dictates of nature; and it is to this seeming contradiction that the present paradox must be referred.

Admitting, then, a final cause of the menstrual discharge, it may be considered as intended, when impregnation is prevented, to relieve the increased local actions of the uterus, without making it necessary that the generative functions should revert to that state of periodical imperfection which characterizes other animals.

It is conceived that some reasons why other animals do not menstruate, are involved in the above positions; since their reversion to a state similar to immaturity, when conception is prevented, is attended by a resolution of the increased sexual actions, without any necessity for discharge to relieve them, or obviate the effects; but as every physiological fact must have its foundation in anatomical structure, it will be desirable and interesting to enquire upon what this exclusion of the inferior animals depends.

It is imagined to arise from the different connexion of the ovum with the uterus, as evidenced in the structure of the placenta. In the human subject the placenta is, in both its maternal and fœtal portions, wholly a production of conception, and formed by the conjoint actions carried on between the ovum and the decidua membrane. In parturition it is separated wholly from the uterus and expelled, the vascular connexion being torn through by the power of uterine contraction, in consequence of which, under improper states of that action, or undue interference with the process of expulsion, the female is exposed to the risk of hæmorrhage.

In other animals of the mammalia class, the structure is very different, as may be instanced in the cow, to which we particularly refer in the following description. The uterus of this animal presents a membranous rather than a glandular structure. When impregnated, no deciduous membrane is formed, but a number of productions or excrescences, which have been termed cotyledons, are discoverable.* These cotyledons correspond with the maternal portion of the human placenta; they differ from it, however, in constituting an actual portion of the uterus itself, and are not expelled with the fœtal part in parturition. The arterial vessels supplying the cotyledons, are direct elongations of the uterine vessels, and terminate in cells communicating with veins, which take up the circulating fluid from the cells, and return it into the system. The fœtal vessels expanding upon these cells in a manner similar with the connexion of the fœtal and maternal portions of the human placenta, produce, upon the same principles, the necessary changes of the fœtal blood; and there is no communication of arterial trunks, so that, when the actions of parturition separate the fœtal portion, no hæmorrhage can ensue.

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* Different opinions have been entertained, whether the cotyledons observable in the uterus of cows are, or are not, pre-existent to conception. The late Dr. Clarke assured me that they were solely the effects of conception, and began to diminish immediately after parturition. Monro, on the contrary, maintains that they are observable long previous to conception; and this opinion is fully confirmed by Morgagni, *Lit.* xlvii. *Art.* 32. Their enlargement at the period of puberty, or when in season, if the impregnation was prevented, would in some degree be analogous with menstruation. These points deserve elucidation.

The same structure which prevents hæmorrhage in parturition, it is conceived, will necessarily obviate the occurrence of menstruation, since, however high the local actions of the uterine system may be carried, the arteries not terminating upon the surface of the uterine cavity, with the view to a particular function as in the human female, but in cells and returning veins, both the necessity and possibility of effusion will be obviated.

The menstrual discharge has been insisted upon by some to occur occasionally during the period of pregnancy; the fact and its possibility has however been strenuously denied by others. Denman asserts that he never knew a case of the kind, and Dr. Hamilton denies it in toto. It almost universally happens, that immediately after impregnation is accomplished, the uterine orifice is closed up by a gelatinous secretion of the follicular glands of the cervix; while at the same time, the surface of its cavity becomes wholly covered by the adhering membranes. Under these circumstances it has been thought impossible that any proper menstrual secretion could take place; and consequently that any sanguineous kind of discharge must have been occasioned by the rupture of vessels in the vagina, or partial detachments of the ovum from the uterus, the fluid effused resembling blood, and not the menses.

Nevertheless, so much evidence may be adduced, that discharges analogous with menstruation, do occur from the pregnant uterus, that the above opinions, however respectable the authority of their supporters, must be considered so far invalidated, as to justify an attempt to ascertain how far the contrary one is explicable by rational arguments and facts.

Although nature is steady in her observance of primary principles, she occasionally deviates in secondary ones. Thus the human ovum, instead of being received into the uterus, and forming an attachment to it by means of the decidua membrane, is capable of being misplaced in the abdominal cavity, to some part of the contents of which it becomes connected, so as to acquire its full fœtal growth, without any intervention of such membrane. Is it not conceivable that the same might occur with regard to the uterus; that this viscus might not be sufficiently actuated by the impregnated ovum to secrete its decidua, and the glutinating jelly of its orifice; and yet that the ovum being received into its cavity, might, by its innate vital powers, form an attachment at the point of placental junction, sufficient to carry on the perfecting process. In this case the orifice not being closed, or the general surface obstructed by the adhesion of membranes, any occasional increased impetus of the uterine vessels, whether influenced by the habit of periodical discharge, or by changes still taking place in the ovarium, might produce the effusion of a fluid analogous with the menstrual fluid. It is also conceived that the same circumstances would also admit of superfœtation, the possibility of which is confirmed by many well authenticated cases.

A case related by Mr. Langstaff* appears to offer some confirmation and illustration of the above opinion. A female who had experienced a fallopian conception died from rupture of the tube in the second or third month of pregnancy. The uterus contained a quantity of gelatinous matter in its body and cervix; the latter was not closed, but freely admitted the finger to pass from the vagina; and there was not the least appearance of decidua membrane. It was ascertained that she had menstruated the week preceding death. Does it not appear evident that, in the above case, the uterine actions had been insufficient to close its orifice and produce the true deciduous efflorescence? in consequence of which the menstrual action was experienced, terminating, however, in a gelatinous modification, which might eventually have inspissated into the true membrane, had the patient survived.

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* Transactions of the Med. Chir. Society, v. 7, p. 437.

In a similar case by the same gentleman,* in which laceration of the tube had taken place about the sixth or eighth week of pregnancy, it is stated that the uterus "contained a beautiful and perfectly formed decidua, but the os uteri was not closed," and that "the menstrual periods had not been interrupted." It would appear in this instance, that the gelatinous secretion of the last menstruation, had been converted into the decidua, and it may be inferred that no subsequent menstruation would have taken place. This corresponds with the common observation of many women, who profess to experience the menstrual state after conception, that such state recurs for one, two, or three periods only, after they become pregnant, and then ceases entirely.

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* Transactions of the Med. Chir. Society, v. 8, p. 503.

CHAP. II.

ON THE

DISEASES OF MENSTRUATION.

Menstruation being regarded as the effect of an aberration from that function of the human female which nature points her out as intended, through the most important period of her life, to be in the constant discharge of, it would scarcely appear correct to consider any variations in the process, as exclusively morbid, since they consist in deviations from an action, which in itself might be deemed a deviation. It has been seen, however, that the human female, by the influence of a second nature, habit and education, and by the intention of the wise Creator of all things, is destined, in decided contradiction to natural constitution, to spend her life, more or less without the exertion of the powers of reproduction, and that in consequence the menstrual modification of the generative actions ensues, as an effect of prevented pregnancy, or becomes necessary, under that state of prevention, to the preservation of her general health. It appears, therefore, proper to regard the occurrence of menstruation under the present state of society, as a proper, natural, and healthy secretion, tending to the sanity and welfare of the unimpregnated female system, and every variation from its customary appearances, as a state of true deviation, and frequently of morbid derangement, since it is rarely found to take place, without being connected, more or less, with a disturbed state of the healthy functions.

Taking, therefore, the common form of the menstrual process as a state of correct action, it is proposed to sketch the history, causes, and medical treatment of its respective deviations, with the object of connecting them with the opinions which have been advanced with regard to the nature of the process.

In attempting to reduce these to a systematic form, the difficulties to be contended with have not failed to present themselves, since not only varied states of deviation are found to result from the same causes, but varied and distinct causes will be found to operate in the production of an individual deviation, the power of discrimination being, in consequence, materially invalidated.

It is proposed to consider the deviations from the correct menstrual process under the following heads:

A. *Deficiency of the Menstrual Actions.*

B. *Excess of the Menstrual Actions.*

C. *Irregularity of the Menstrual Actions.*

A. *Deficiency of the Menstrual Actions.*

Deficiency of the menstrual actions is accompanied by a total want of the discharge; or a partial production of it; and may be varied in its symptoms, or occasional causes, according to the period of life at which it occurs; as at the age of puberty; in adult age; or in advanced life, when the generative functions are approaching their natural termination.

Under all these variations, it originates, as respects its remote cause, from deficient action of the ovaria; the maturation of the ova being prevented or retarded, and the correspondent actions of the uterus, in consequence, rendered proportionally defective.

This deficiency of ovarian action generally, may depend upon imperfect organic constitution of the ovarium itself, preventing the formation of ova, or occasioning their slow evolution or maturation; it is, in this case, to be regarded as a mere prolongation of the period of impuberty, and not strictly as a morbid state.

The defective action may, however, be produced by derangements in the whole, or part of the general system, expending that nervous energy which would otherwise have actuated the uterine system. Here it is necessarily the accompaniment of a deranged state of the healthy functions, or, in other words, of disease.

It is proposed to consider these states of deficiency, according to the respective periods of life when they are found to take place, *viz.*

a. At the period of Puberty.
b. In adult life.
c. In advanced life.

a. Deficient Menstruation at the Age of Puberty.

When this state is the effect of such decidedly imperfect organization, as necessarily precludes the formation of an ovum, it will be vain to expect advantage from medical art; the subject is inevitably doomed to perpetual impuberty, and consequent sterility.

If, however, the organic defect exists only in a degree sufficient to produce a slow or retarded development of the ovum, it may be attempted to excite the ovarian actions to increased activity, by stimulating applications to the loins, thighs, or pubes; as frictions, stimulating plasters, or the electric fluid; or the semicupium might be used; or ligatures or a tourniquet applied around the thighs; dancing and sexual excitements would probably be found beneficial; and lastly, some of those medicines which have been conceived to exert a specific action on the uterus; what these are is doubtful, but the intention, it is conceived, will most probably be answered by hellebore, savine, and madder.

The deficiency of menstruation at the age of puberty may be the secondary effect of some of the more important diseases to which the human body is liable, as phthisis, scrophula, &c. &c. and which, by exciting unnatural and morbid actions in the system, have the effect of perverting or suspending the natural ones. The treatment here will be absorbed in the particular attentions which the primary individual disease may require, and cannot be made the object of our present consideration.

There is, however, one peculiar form, the accompanying symptoms of which have been more particularly known and described under the term *Chlorosis*, not marked by any determinate disease, and which requires especial notice.

The leading feature of this deranged state, is the diminished energy of the organs of nutrition; the stomach and biliary system become inactive; the functions of digestion, assimilation and absorption of chyle are improperly discharged; and, in consequence, the whole system falls into a state of debility; the colour of the skin becomes pallid, or livid, from languid circulation of the arterial, or deficient action of the venous and absorbent systems; and, from the latter cause, œdema is apt to supervene. Along with these derangements, arising from the deficient actions of the more immediate chylopoietic viscera, the debility communicating to the organs of fæcal evacuation, renders them torpid and inactive; in consequence, constipation, with the effects of accumulation, is produced, and materially aggravates every symptom.

Nor is the uterus a mere passive sufferer under this state of disease; its natural actions are not only interfered with and depressed, but in consequence of its sympathy with the general system, and the stimulus of accumulated fæces, a series of symptoms peculiar to itself, are occasioned, which materially influence and characterize the morbid state. Amongst these which are so analogous with the effects of pregnancy, that it is occasionally difficult to discriminate them from that state, the excitement of morning sickness, and the pica, or craving for unnatural aliment, are not the least remarkable.

A knowledge of the occasional causes of this state is of importance to its prevention and removal. As the affection is chiefly found to occur in civilized life, and amongst the higher clases of society, it may be inferred, that the circumstances of habits or education are materially implicated in its production. The following are to be regarded as the more powerful exciting causes, *viz.* too copious or rich and undigestible aliment, affecting the stomach and alimentary canal; or, on the contrary, a defect of proper nourishment; sedentary habits, inducing inactivity of the vital and animal functions; and cold applied to the surface from inattention to cloathing; all these have a tendency to impair the actions of the chylopoietic viscera, to render the bowels torpid, and give rise to defective nutrition, constipation, accumulation, and their immediate effects on the general system, and the uterine organs in particular.

In the treatment, it is of the first importance to obviate these exciting causes, by every requisite attention to proper diet, exercise, and cloathing. Attention to these points alone, will generally be sufficient to prevent or remove the improper state of action. In addition, the digestive powers may be strengthened or confirmed by gentle stimulants, or by promoting the natural action of the alimentary canal, as by mild aperients, steel, bitters, myrrh, and aromatics. The local irritations acting on the uterus should be obviated, by carrying away, or preventing, accumulation in the intestinal canal, by the occasional use of the stronger purgatives, as the aloetic compounds, calomel, jalap, sulphas magnesiæ, &c. or by emollients and stimulating injections; and the natural actions of the ovarium may be excited or encouraged, in the manner before described.

b. Deficient Menstruation in Adult Life.

The deficiency of the menstrual actions occurring during the vigour of life, and subsequent to their regular establishment at the age of puberty, is always to be considered as the effect of disease interfering with the proper discharge of the uterine functions.

This state, which has been termed, *suppression* of the *menses*, in its occasional causes, and treatments, so little differs from the preceding variety, that few additional observations are necessary. It may be noticed, however, that the morbid states which give occasion to it are generally more decided, and difficult to remove; the power of habit tending forcibly to preserve the correct actions of the uterine system, under minor states of disease. It is of importance, also, to distinguish its existence from the effects of pregnancy.

c. *Deficient Menstruation in Advanced Life.*

THAT deficiency of menstruation which takes place in advanced life, and accompanies the diminution of sexual power from natural causes, is the effect of changes occurring in the ovarian system, which are then reverting into a state of inaction and generative incapacity.

This is not a *morbid*, but a *natural*, state of the female system, and no medical attention can prevent its eventual establishment. It is probable, however, that this sexual failure may, in some measure, be protracted by art, as by the subjection of the uterine system to a moderate increase of stimulus; but the greatest care must be taken, that the increased excitement does not augment that tendency to disease, which is apt to supervene at the period of menstrual cessation; on this account such attempts should be discouraged.

The cessation of the menses, although not a morbid state, and taking place in many women without any alteration of health, and in some with manifest advantage to it, is so frequently connected with disease, that it is regarded by all women as a most important period of their existence, and as the cause of their sufferings. It cannot excite surprise that the interruption of a function, which has been established for so many years, and acquired the force of powerful habit, should be productive of considerable increased actions and determinations, connected with the stoppage of an habitual discharge, under the plethoric and irritable constitutions of modern females; hence, any deranged action, to which the female is obnoxious, is apt to become aggravated at this particular period.

The effects produced will necessarily be consonant to the individual states of disease, or predisposition; and may consist of determinations to the head, threatening apoplexy, palsy, insanity, &c. or to the mammæ, or other glandular structure, inducing cancerous disease; in short, it is impossible to enumerate all the derangements of structure and functions which may be called into action.

The treatment of these states must vary according to their respective natures; but they are all preceded by, or connected with, symptoms of plenitude and irritation, to the removal of which it will be of importance to pay the strictest attention.

With this view, proper regimen, diet, exercise, and great mental quiet, must be inculcated. The bowels should be preserved in a regular state, by mild aperients, the more stimulating and drastic purgatives being avoided; local bleeding may be used, where local symptoms indicate it; and general blood-letting occasionally, in moderate quantities, if the tension or irritability of the system are great; it must be recollected, however, that considerable or repeated evacuations of the blood vessels have a tendency to increase the plethoric state, and may ultimately aggravate the effects of it.

A general adherence to the antiphlogistic plan will be desirable; and any excessive action of the arterial system should be abated by the administration of saline draughts, and the vegetable and mineral acids.

Attention to the above, solely, will generally be sufficient to allay the irritability of the system; when, however, the latter is excessive, relief may be found from opium, or hyoscyamus, camphor, the resinous gums, and occasionally steel and bitters; but under this treatment, particular attention must be given to preserve an open state of the bowels.

The disposition to local determination will be relieved or diminished by the excitement of a counter irritation, as a continued blister, issue, or seton; or by partial warm baths.

The cessation of the menses is frequently accompanied by an irregular state of the discharge, both as relates to period and quantity. This is not, however, peculiar to that time of life, and its consideration will be embraced hereafter.

B. *The Menstrual Actions are in Excess.*

This division of menstrual derangement separates itself into two distinct varieties:

a. The menstrual fluid is too copiously effused.

b. The menstrual state is influenced by an inflammatory tendency of the uterine actions.

a. The Menstrual Fluid is too copiously effused.

Too copious effusion of the menstrual fluid is an occurrence which frequently takes place in the female system, and embraces a variety of considerations connected with its nature, causes, and treatment, which are decidedly at variance with each other.

The quantity and nature of the menstrual discharge will be influenced by the force of the circulating power, as connected with the state of the arterial orifices, from whence the fluid is secreted; these will be found to bear very different relations to each other, giving rise to an almost infinite variety of effects.

The varieties may, however be reduced under two general heads.

1st. The vis e tergo of arterial action is increased; the tonic state of the uterine vessels continuing natural, or not being proportionally increased.

2d. The tonic state of the uterine vessels is diminished; the vis e tergo of arterial action continuing natural, or not being proportionally diminished.

In the first case, the increased effusion will partake of the nature of an active discharge, the symptoms being those of a full and plethoric state of the system.

Its principal cause is too luxurious a mode of life; and which has a tendency to induce plethora. The treatment will, consequently, require a cooling and temperate diet, joined with exercise, and active employment. The necessary medical attentions will be, to preserve a regular state of the bowels, and to adhere to the general antiphlogistic plan; and occasionally, bleeding may be serviceable, although the habitual use of it ought to be carefully avoided.

Local treatment is scarcely necessary, and it is doubtful whether admissible, as it is not easy to diminish the arterial action of the uterine organ by local evacuation, without a risk of diminshing, at the same time, the tone of its vascular orifices beyond the proper standard. When, however, the discharge is excessive, the local application of cold will be found advantageous; which, at the same time that it diminishes the arterial action, by abstracting caloric, has the effect of constringing the vascular orifices.

There is some reason to believe, that the use of lead, as the acetate, will have the effect of diminishing the local actions of the uterine vessels; if so, it might possibly be advantageously given in the present instance.

In the second variety of profuse menstruation, the copious discharge is to be considered as passive, the secreting orifices of the uterine vessels being too relaxed to retain properly their contents; hence the effusion, instead of preserving the true appearance of menstrual fluid, frequently partakes of the sanguineous nature, passing away in coagula.

This state is universally the effect of local debility of the uterus, notwithstanding a distinction has been drawn with respect to that debility, as arising directly from an abstraction of tonic power, or indirectly, from previous excessive action. The former may be produced by extensive hæmorrhage taking place from the system generally, or the uterus itself. In the latter case, which is the one that will be found, almost universally, to influence this state of menstrual deviation, the uterine debility will be the effect of previous excessive action, either the consequence of the uterus sympathising with the general system, or of morbid states, or excessive action of the uterus itself; as from repeated child-bearing, abortions, the irritation of constipation, injuries or diseases of the uterus, &c.

When the uterine vessels are suffering under the above states of debility, an increased vis e tergo of the circulating force, produced by any actuating cause, and particularly the periodical maturation of an ovum, will have a tendency to render the effusions of those vessels more copious than they naturally would have been, and to give rise to all the effects of aggravated debility.

In the treatment, the obviation of the occasional causes will require particular attention; as, for instance, the morbid actions which have previously existed, and preceded the excess of discharge; constipation should be carefully guarded against, as well as the indulgence of improper habits.

The debility of the general system, is to be removed, by what is termed the tonic plan, embracing, in particular, the regulation of the digestive organs; this may be effected by the use of preparations of steel, bitters, myrrh, astringents, the mineral acids, exercise, cold bathing, &c. Care should, however, be taken not to excite the general actions too forcibly, without removing proportionally the local debility, which may be advantageously done, by the external application of cold to the pubes, &c. and by cold or astringent injections.

b. The Menstrual State is influenced by an Inflammatory Tendency of the Uterine Actions.

An attempt has been made to establish that the actions of the human female are occasionally extended, without the influence of impregnation, to the production of the deciduous membrane, as a modification of the menstrual fluid; and that this kind of action is analogous with that state of inflammation which gives rise to the effusion of coagulable lymph.*

The occurrence of this deciduous secretion at the period of menstruation, is productive of very considerable distress; as, by an useless and foreign substance formed with the uterine cavity, that viscus is excited to a series of contractions to effect its expulsion, and the attempt is accompanied by all the symptoms of an early abortion. The state of pain is frequently excessive, and considerable fever is occasionally excited. The repetition, at regular periods, harrasses the unfortunate patient, and deprives her of all earthly enjoyments. After a term of inexpressible suffering, the attack terminates in the expulsion of the deciduous membrane, which is sometimes thrown off in a perfect state, taking on the form of the whole cavity of the uterus, but more commonly in detached pieces, as if torn into fragments by the violence of uterine action.

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* "The decidua resembles a good deal in its appearance, as well as in its mode of formation, the lamina of coagulable lymph, which is formed by inflamed surfaces. Both membranes are of a yellowish white colour; both are tender, pulpy, and vascular. The lamina of coagulable lymph is formed by an inflamed membrane; the uterus, before the decidua is formed, becomes more vascular so as to change into a state analogous with inflammation. —*Hunter's Description of the Gravid Uterus.*

The accompanying discharge is generally scanty, and not of the nature of menstrual fluid, but more resembling the effusions and weepings from wounded vessels, or the lochial discharge after parturition. The cause appears to be a too active or inflammatory state of the ovaria, throwing the corresponding actions of the uterus into excess; this may be the effect of peculiar constitution, influenced by constipation, luxurious living, or mental states.

The treatment distributes itself under two indications—to relieve the existing paroxysm; and to prevent the future recurrence.

The first is to be attempted by taking off the spasmodic action, attending the uterine expulsion, by the free use of opium, or hyoscyamus, and the warm bath. Friction on the parts in pain will be found to give particular relief. To these may be joined a cooling regimen; saline draughts, and occasionally antispasmodics, as camphor, æther, &c.

The more important indication is, however, to prevent the future returns, by obviating the sources of excessive ovarian action. With this view, irritation of the uterine system, from accumulation in the bowels and rectum, is particularly and regularly to be guarded against; the whole regimen should tend to preserve a cool and quiet state of the system, whether directed to the regulation of food, exercise, or the mental state. Such medicines as possess a specific sedative effect on the uterus would be indicated in this case, but the existence of such medicines is hypothetical. The author has been in the habit of using the super-acetate, in half grain doses, twice or three times a day, with at least fancied success, and without any ill effect. The local actions of the uterine system may also be diminished by the occasional application of leeches to the loins or pubes, and a counter irritation may be kept up by a perpetual blister, or stimulating plaster to the back. By attention to this plan, the author has frequently had the pleasure of seeing his patient restored to a state of comparative comfort, notwithstanding, in other instances, every attempt to relieve has proved fruitless.

C. *The Menstrual Actions are Irregular.*

By irregularity of the menstrual action it is meant to imply, that the discharge deviates from its customary appearance, either in regard to the intervals observed between its terms, or in the quantity, or the quality of the fluid effused; such deviations alternately varying or oscillating, on each side of the proper modification, from states of excess to states of deficiency, et vice versâ, from states of deficiency to states of excess.

Irregularity of the menstrual discharge is, therefore, scarcely to be regarded as a distinct modification of deranged action, but, on the contrary, as combining the whole of the phenomena involved in the previous considerations of defective and excessive action.

Irregularity is common to every period of sexual life, but is, perhaps, more general in the earlier and later stages of it, as being then exclusively connected with the establishment or recession of the ovarian or generative actions.

Every cause which is capable of producing derangement in the actions of the uterine or general system, has a tendency to give rise to irregularity in the menstrual actions.

As the rationale of symptoms, and the treatment, varies in different periods of life, it will be right to consider the irregular states of action, under the following heads.

1. The age of puberty, or about the time when menstruation becomes established.

2. After the full establishment of the process, or occurring between the period of establishment, or cessation of the menses.

3. In the decline of life, when the generative actions are finally receding.

1. *Irregularity about the Age of Puberty.*

THIS state arises from the ovarian actions not having been yet fully and habitually established. After the orgasm of an ovine maturation, these probably fall into a proportionate state of inaction, particularly if that orgasm had been accompanied by any inordinate excitement; and a correspondent debility with consequent protraction or imperfection, in the maturation of the succeeding ovum, may be induced.

Irregularity at this period is, therefore, to be considered as most intimately connected with the state of defective action, and particularly of *Chlorosis*, and is to be treated upon principles similar to what are recommended under that head.

2. *Irregularity, occurring between the periods of establishment or cessation of the Menses.*

THIS state of deviation may be regarded as universally the effect of diseased or deranged action of the uterine or general system, and as strictly consisting in aberration from the correct and customary periods, or the quantity and nature of the discharge.

The nature and causes of the deranged actions which are found to affect the menstrual process, whether as productive of deficient or excessive action, have been before detailed. It chiefly remains to show in this place, how the above contrary states can be brought to alternate in the same system, so as to occasion the state of irregularity which has been expressed or defined above.

It is conceived that excessive action will naturally prove the cause of succeeding deficiency, by increasing the sources of future debility, either by great expenditure of vital principle, or from the direct sedative effect of too copious evacuation ; and, vice versâ, that defective action may prove the cause of subsequent excess, by allowing an accumulation of the various sources of uterine or ovarian excitement; hence, when one of these states is by any cause induced, there will be a decided tendency in the other to follow as a consequence, the different states operating as cause and effect to each other; and as long as these causes are allowed to influence, a successive and permanent series of the varying effects may be produced. The above actions will be most decidedly called forth under irritable constitutions, where slight impressions occasion powerful effects.

The treatment in these cases must be conducted according to the principles which have been laid down with respect to the states of defective or excessive menstrual action, and will require a nice and accurate discrimination of the primary exciting causes, and the effects resulting from them as connected with the existing states of deficiency or excess.

3. *Irregularity occurring when the Menstrual Actions are finally receding.*

As the first variety is connected with the primary establishment of the menstrual state, so is this with its final cessation.

It is not to be wondered at, that a discharge, established in the system throughout so long a period of life, and confirmed by the force of habit, should evince frequent and powerful attempts to retain its influence, and hence, particularly in the irritable constitutions of modern females, the phenomenon rarely recedes without irregularities, which will, in some instances, even continue to manifest themselves until very advanced life, and long after all capacity for performing the generative function is lost.—This period of irregularity is familiarly known amongst females as "dodging time."

When simply connected with diminishing action of the ovaria, the irregularity can scarcely amount to a morbid state; but, as it frequently becomes complicated with the existence of, or predisposition to, organic disease of the uterine or general system, its prevention or removal becomes a point of the utmost importance.

For the farther consideration of the nature and treatment of this irregular state, reference may be made to what has been advanced respecting the production of irregularity in the previous periods of life, and the states of defective and excessive menstrual actions, in which that consideration is conceived to be fully involved.

CHAP. III.

ON THE MANAGEMENT OF MENSTRUATION.

It is proposed, under the present head, to lay down the principles upon which, in conformity with the foregoing views, the menstrual actions ought to be regulated, with a view to preserve them in a proper healthy state, under the various periods of life, and more particularly at the time of their first establishment. The author is not aware that such consideration has hitherto been taken in any of the more popular treatises on the subject, and conceives that the detail may not be useless to the young practitioner in particular, as well as lead to more correct views of the subject amongst females themselves.

It has been attempted to show, that whenever the menstrual actions run into derangement, this is chiefly to be referred to the following sources; namely, improprieties of diet; sedentary life; and exposure to cold; and that these operate generally by diminishing the powers of the digestive organs, and alimentary canal, occasioning defective nutrition and costiveness; in consequence of which the healthy actions of the system are interfered with.

It is to a careful prevention, or removal, of these causes, that the anxious mother, who is desirous to preserve her child at this interesting period from disease, and from disease which may implicate the whole happiness and comfort of her future life, should direct the fullest attention.

With regard to diet, the manners of society have introduced habits which are without doubt very destructive to the health of its individuals. This is a point which it is conceived will not be disputed, as applicable to society at large. Indulgences in luxurious food can ill be supported by those whom long custom has habituated to its effects; in the female of tender years, it cannot therefore be wondered at, if bad consequences ensue, and the powers of health sink beneath the noxious influence. At no period of life do improprieties of diet operate more largely than at the age of puberty, when so new and extraordinary an action is being introduced into the system, and which renders it peculiarly sensible to all impressions.

The importance of adopting at this time, as mild and unsophisticated a regimen, both with respect to food and beverage, as is consistent with the habits of society, cannot be too strongly inculcated.

The female may be allowed a due mixture of plain animal and vegetable food, with small beer as a beverage; but all high seasoned viands, fat, pastry, sweets, and stronger fermented fluids, as wine, spirits, ale, &c. should be denied, as tending to derange the stomach, and consequently produce improper actions in the system. The use of tea, as an article of food, although rendered by universal custom almost indispensible, is probably highly injurious to society in general, and in particular to females under the present circumstances; its peculiar principle, extracted from a bitter herb, the qualities of which, in many instances, are almost poisonous, inducing, at least, high states of nervous debility, cannot supply any real nutriment to the system, and probably tends to weaken the tone of the stomach and bowels, and to increase that disposition to costive habit, which is so characteristic of the females of the present day.

But the quantity, as well as the quality, of food should be regulated; a sufficiency of course is indispensible; but too large a quantity implies an equal, or greater error; if digested, it must over-exert the stomach, and give rise to its subsequent debility; if undigested, it will load the bowels with a mass of offending contents, which, by their accumulation, must produce unnatural and inordinate actions to effect their discharge, and thus lay the foundation for future disease.

It will be right also to urge the advantage of regularity with respect to the times of taking food; a great deal in this respect will depend upon the habits of the individual; food taken at any other than the customary periods will generally disagree; and if denied at those times, the patient will suffer in consequence; the great point therefore will be to establish proper customs.

Three meals in the day are probably better than more; viz. breakfast, dinner, and supper. Experience teaches us that, in human society, dinner is the best meal, and that the supper should be light; if we act upon this principle, it is not probable that the breakfast will be otherwise than a hearty one.

Now admitting the advantage of taking food but three times a day, it must be evident, that these meals should be distributed, as nearly as possible, into equal periods; the breakfast early in the morning; the dinner in the middle of the day; and the supper in the evening. These periods are unfortunately decidedly at variance with the customs of modern society, and particularly of the fashionable world; nor is it probable that any medical precepts will produce an alteration in them, for the law of custom too generally overpowers the laws of nature and of reason.

The next source of obstructed menstruation in young females, is confining them to sedentary habits.

The influence of the modern system of education upon the health of young females is well known, and in particular, that part of it which occasions a confinement to sedentary and monotonous occupation. That freedom of bodily exertion which the natural feelings of youth prompt, being denied, the vital and animal functions fall into languor and torpidity. The acquisitions of intellectual power, or of individual accomplishment, which are thus gained, are often dearly purchased by the sacrifice of health, and a proportionate debility of bodily power; and hence obstructed menstruation is so prevalent amongst the higher classes of society.

To prevent these consequences, it is of the first importance, that whatever system of education may be pursued, daily and regular exercises should enter into its arrangements, more particularly when the female is approximating to the state of expected womanhood.

Exercise, with this intention, may be taken either by riding on horseback or walking; the latter is however preferable. The motion of a carriage is too easy, and indeed differs little from sitting in an easy chair.

Exercise should be pursued upon system, and taken as regularly as food or sleep; and it is always desirable to combine it with amusement. But it must not be forgotten, that there is a medium in all things, and that even exercise may be excessive, and is always so when carried to fatigue. Dancing is particularly liable to this objection, notwithstanding it appears to be a natural mode of pleasurable exertion, and, when taken in moderation, will be both salutary and serviceable.

Exercise is most advantageous before dinner, or when the process of digestion has proceeded to a length.

The next consideration which requires notice, is the caution necessary to avoid exposure to cold. The disposition to be affected by cold, will be materially influenced by the attention to, or neglect of, the foregoing points; a due and healthy state of the organs of nutrition and bodily power being preserved by proper diet and exercise, the susceptibility of cold will seldom be great, as the associations or sympathies of the nervous, or vascular system, on which it depends, will be little powerfully excited.

In order to guard against the effects of cold, a proper adaptation of external warmth is of importance, so as to preserve a regularity of temperature, whatever may be the state or vicissitudes of the weather; the cloathing should be sufficiently warm, and not partially so; the feet in particular should be kept warm and dry; and sudden changes of temperature, particularly from cold to heat, avoided; for the latter is far more deleterious than the reverse from heat to cold.

The various actions of the body, it is well known, will be influenced by the state of the mind; on this account every unusual mental excitement should be restrained, while at the same time, proper and rational amusement should be encouraged.

But at this interesting crisis of female life, it is of the first consequence to pay a strict attention to remove improper or constipated states of the bowels, and prevent the establishment of habitual costiveness: few instances of obstruction take place, in which costiveness is not a marked previous symptom, and it may even be said, a strong exciting cause.

A leading object with this view will be to encourage a regular habit of evacuation; the inclinations for it should never be disregarded, as this will necessarily give rise to more or less accumulation, and lay the foundation for habitual costiveness. It should be laid down as a rule, never to allow a day to pass without one or two evacuations, and, whenever this is disappointed, to produce a full or double effect on the following day, by means of some mild aperient; or in case it proves insufficient, which, however, is only to be expected when the costive state has become habitual, more active means must be resorted to.

When the system has fallen into a decided state of habitual constipation, no means should be left unattempted to remove it. With the above intentions, as mild purgatives, castor oil, or lenitive electuary may be used, or small doses of Epsom salts. Where more active measures are required, pills compounded with aloes or gamboge, or what have been termed the more drastic purges, must be administered, but care is to be observed in their use, as all excessive purgings are followed by more or less subsequent weakness of the bowels.

In order to get rid of habitual costiveness, regular daily, and moderate evacuations, should be secured. The following pill will frequently answer the present intention in an efficacious manner, and even produce the desired effect, where the most powerful purgatives have been totally inert. Take,

Succotrine aloes, one scruple.

Powder of ginger, half a drachm.

Powder of ipecacuanha, eight grains; make them into a mass with a sufficient quantity of syrup; divide it into sixteen pills; of which one should be taken every day an hour before dinner.

After a regular action of the bowels has in this way been kept up for a time, it will be admissible to diminish gradually the dose until the whole may be discontinued; in this way habitual costiveness will frequently be done away with.

It is in the next place proposed to give some directions for the management of the discharge, when it does take place, and during its continuance.

Women generally entertain an opinion that, unless the discharge takes place to a certain extent, it will be insufficient to preserve them in health; but it is not the quantity, but the effect of the discharge, which ought really to be regarded; so that the actions of the womb are properly relieved, the less the quantity, the better it will be; any thing farther is an excess, and may lay the foundation for future derangement and ill health.

Hence the ideas which mothers, and the academic guardians of young ladies, entertain of the necessity for means to provoke and increase the quantity at the time of their first appearance, are in some measure mistaken ones; as for instance, the use of steel medicine, warm gingered beer, and immersing the feet in warm water. Nature, if not interfered with, will be all-sufficient; and when the various points of regimen, &c. before detailed, have been attended to, the discharge will be almost certain to take place in an adequate and correct manner.

The most healthy state is when the discharge flows gradually, and without pain, or clots or skinny matters accompanying it; otherwise it will come in sudden gushes, attended by considerable grinding pain in the back, or elsewhere; this arises in consequence of some accumulation having taken place, which produces an active contraction of the sides of the womb to expel it, and is always to be regarded as indicative of a disposition to derangement; the pain which here occurs is generally of a spasmodic kind. In this case it will be right to direct frictions upon the back or parts in pain with a warm dry hand, or with some stimulating application, as the Eau de Cologne; and should the pain be excessive, a warm fluid may be taken, as tea, or a little brandy and water, which will tend to excite the expulsive powers of the uterus, discharge its irritating contents, and thus relieve the pain; or if these are insufficient, fifteen or twenty drops of laudanum might be given; but without a strong necessity it is far better to avoid the use of this powerful medicine; whenever the symptoms are such as to appear to demand it, this may be regarded as the effect of a diseased state, and it will be better that a medical opinion should be taken.

Sickness and nausea, as well as head-ache, accompanying the period of menstrual discharge, will almost universally be found connected with existing costiveness, and will be relieved or prevented by attention to the bowels.

The mind of the female should be preserved from anxiety, and all excesses of emotion; her diet and whole regimen such as is most consistent with general health and the principles before laid down.

It has been usually recommended to discontinue the use of active medicine during the discharge, and with much reason, as any considerable excitement in the system has a tendency to interrupt the proper actions of the uterus.

The greater part of the above directions will not only contribute to the proper establishment of the discharge on its first appearance, but also to preserve its correctness, throughout subsequent life, so as to ensure a regularity of the process, and thus to preserve health.

Little will remain to be added relative to the management of the discharge during adult life, and subsequent to its first establishment; correct rules being at first adopted, and persevered in, there will be little fear of derangement; and when this takes place, it will more commonly be found the consequence of some general disease, which should be attended to accordingly.

When obstruction of a temporary nature takes place, arising from cold, or any other cause, and the action of which may have a tendency to derange or diminish the menstrual ones, the feet will with advantage be put into warm water, at the expected period, or some warm fluids may be taken to excite gently the arterial system, or frictions applied to the loins in the manner above described, in order to elicit more determinately the actions of the womb; it is however desirable to interfere but little, as complete stoppage may take place for a time or two, without any material injury to the general health, or future periods of discharge. In the same manner, occasional increases of the discharge, beyond the usual quantity, are not to be regarded as uniformly important; they are indeed seldom so, unless accompanied by great pain, or clots, or skinny matters, in which case it will be proper to resort to medical advice.

The more unimportant excesses of discharge will be best relieved by keeping the body and general system quiet, taking cooling and sparing diet, and other obvious means.

The cessation of the menstrual discharge, in advanced life, is a source of much anxiety to females, as fraught with serious consequences to their general health. It is, as has been before observed, an effect of natural causes, and consists in the recession of those actions which first gave occasion to it. In a well regulated system this is productive of no ill consequences, and in many constitutions, on the contrary, followed by an improvement of health, if it had previously been deranged.

But the apprehensions of females at this period are not without some reason, as where the system has been rendered highly sensible and irritable, in consequence of acquired habits, and associations of civilized life, any pre-existent tendency to disease is liable to be thrown into action, from the suppression of a function which has so long influenced it.

The effects, however, it is probable, will rather be confined to the production of general disease, than to derangement of menstruation itself; thus women at this time are found more liable to giddiness and affections of the head or stomach, or rendered more nervous and irritable; under aggravated circumstances, these may go on to the more serious and important diseases, which have before been alluded to.

In order to diminish this tendency to disease, it is of consequence to keep the bowels in due order, and to preserve the system quiet, and free from all bodily and mental irritation; exercise will be beneficial, but all extraordinary agitation of the body should be guarded against. The great object is to avoid every thing which can throw the system into an unusual action. The regimen should be temperate in all respects, as the contrary will not only impair the actions of the stomach and bowels, and thus affect immediately those of the womb, but also be more likely to throw any latent disease into action. The rules which have already been detailed in managing the first commencement, will generally be applicable in the present case.

Bleeding occasionally, with a view to prevent ill effects, is by no means necessary at this period; on the contrary, it tends to induce a higher disposition to be affected by the causes of disease, by increasing the plethoric state of the vessels. It is only when diseased symptoms have actually taken place that it becomes proper, and here should be resorted to with caution, and under the advice of a medical man.

It is impossible to censure too strongly, under this decline of power, attempts, on the part of females, to keep up or recal those actions which nature indicates ought to cease, by stimulating medicines and other means, which may have the effect of inducing organic diseases of the womb itself, or exciting derangements of the general health.

ESSAY II.

ON

A SPECIES OF ABORTION.

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It is a circumstance which has long attracted observation, that women who have once miscarried are incidental to repetitions of that misfortune, so that a remark has been made that one abortion paves the way to another. This tendency to repetition has very generally been attributed to the power of habit;* but if habit consists (as it has been defined) "in a tendency in parts to repeat actions which they have before repeatedly performed," it may be demanded the actions of pregnancy. This cause, which is connected with the discharge of the placental functions, and their effects on the welfare of the child, will form the leading subject of the present Essay; and as its action and consequences appear to be chiefly confined to delicate females in high life, who are thus denied, by repeated disappointments, the gratification of having children, as well as suffer in consequence the most alarming ravages upon their health; and the view which it is proposed to take will suggest a successful mode of treatment: the subject appears, independent of its novelty, to merit well a patient and attentive investigation.

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* "The sexual parts of females, on account of their active sensibility, are, in a very marked and peculiar manner, subject to the powerful influence of habit. The uterus that has prematurely expelled a fœtus, preserves a kind of propensity to perform the same act when arrived at an equal period of gravidity."—*Richerand's Physiology*, p. 304, 1803.

In order that the vital actions may be properly sustained, it is necessary that the circulating sanguineous fluid, upon which vitality so materially depends, should be subjected to a certain principle contained in atmospheric air, and which is well known under the term *oxygen*, and which is in ordinary life effected by the function of respiration, carried on by the lungs. In consequence of this subjection of the blood to the oxygenous principle, certain important changes are produced in the nature or quality of that fluid, and which are so material, that any interruption in, or deviation from, the process, is certain to be succeeded by disease, and frequently by death.

A diversity of opinion exists amongst physiologists as to the real nature of the changes which are thus induced on the circulating fluid by the process of respiration. Some have conceived that the principle of oxygen is absorbed from the atmospheric air by the action of the lungs, and that it combines chemically with the blood, imparting to it its new principles and properties. Others maintain that certain noxious principles contained previously in the blood, as carburetted, or hydrogenous matters, enter into union with the oxygen, and produce carbonic acid gas, and aqueous vapour, which are thus removed from the circulating system, and carried away by expiration.

Others, adopting both views, suppose, that an energetic positive principle is acquired, as well as a noxious one eliminated.

Whatever may be the real action induced, it appears certain that two important effects result. 1st. That an evolution of caloric is produced, affording the necessary stimulus of heat. 2d. That certain changes are produced in the electric properties of the blood, which adapt it to maintain the principle of vitality.

It is, however, by no means of importance which of the above explanations we may be disposed to admit, with respect to the present point, as, *mutatis nominibus*, any will sufficiently answer our purpose; but as it will be desirable to assume definite principles, in order to carry on a consistent argument, it is proposed to regard the actions of the respiratory organs as imparting oxygenous principle directly to the blood, and thus effecting the requisite changes in its constitution.

In the fœtus in utero, the same changes are necessary in the circulating fluid as are thus produced in subsequent life; and a deficiency with regard to them is equally certain to be followed by disease, or the death of the individual; but as, under its peculiar circumstances of situation, no possibility exists of the fœtal blood being subjected directly to the action of the external air, by means of the pulmonary system, so as to derive the oxygenous principle, it becomes requisite that a provision should be made to supply it in an indirect manner.

This is effected by means of the placental structure, which, at the same time that it answers the purpose of a chylopoietic organ, in affording supplies of nutritious principles, derived from the mother, also serves in the place of lungs, and is the means of producing the requisite changes in the fœtal blood, by imparting to it from the system of the mother, a portion of that oxygenous principle which she had previously acquired in consequence of the respiratory actions of her proper pulmonary system.

Whatever causes operate to prevent the fœtus from deriving, in this way, an adequate supply of oxygen, will necessarily tend to throw its vital actions into derangement or disease, and even not unfrequently to implicate its existence.

It is the object of the present Essay to show that such defect in the oxygenating principle of the fœtus is by no means a rare occurrence, and that it is frequently productive of those repetitions of abortion, at determined periods, which have been before alluded to.

The first symptoms of the affection which I am about to detail, manifest themselves generally at some determinate period in the same patient, most frequently about the third or fourth month, but occasionally not until the seventh month, after conception.

She will, in the first instance, find herself affected by a slight degree of languor, especially when in a close room, which is relieved by opening the door or window, or by walking about the room for a short time. The affection is so slight, however, as to attract little notice, and in other respects the pregnancy appears to be proceeding in an ordinary and regular manner.

In a while, the symptom increases; is oftener experienced; or is more severe in its effects; some oppression is felt about the chest; the languor gradually increases, and is accompanied by a disposition to faintness, and an evident shortness of breathing; nor does the patient derive the same relief she had formerly done from exposure to cold air.

After this, as the pregnancy advances the whole of the above symptoms become gradually more and more aggravated; the languor and disposition to faintness increase, and the respiration is attended frequently by a sighing.

The symptoms now take place under all circumstances; neither horizontal position, lying in bed, or exposure to cold, afford an exemption from the attacks, until, at length, generally, on awakening from sleep, the patient experiences a change in her feelings and general symptoms, which make her sensible that the child has ceased to exist.

When this occurs, the previous symptoms indicative of pregnancy, and also those described above, which are preparatory to, and connected with, the disposition to miscarriage, immediately go off, particularly the states of languor and syncope, and the patient begins to recover her customary health and spirits.

But in the course of time, frequently not until a month has elapsed, the uterus takes on its parturient action, which, manifesting the common process of abortion, or premature labour, produces at length the expulsion of the dead fœtus.

There are certain states of constitution, or of structure, which appear to give more particularly a predisposition to this species of disappointment in pregnancy. Ladies in high life, who are of delicate frame, and have been educated under habits of refinement, and intellectual acquirement, and who appear to compensate for their superiority of mental endowments, by a proportionate debility of bodily powers, are much incidental to it, and particularly those who are subject to profuse menstruations, fluor albus, or who suffer under any other sources of general weakness.

Women with flattened chests, or in whom the cavity of the thorax is, from any cause, rendered defective, whether the diminution proceeds from imperfections of the bony matter, or any trenchment made upon it, or interruption to its proper play or actions, in consequence of pressure from the various abdominal viscera, or in any other manner. Upon this principle it is probable, that enlarged states of the liver frequently give rise to abortion.

In the latter case, however, this tendency may be increased or influenced by some connexion existing between the actions of the hepatic system and the principle of oxygenation of the blood.

Looking at the above symptoms and states of predisposition, there will be no great difficulty in assigning the rationale of the present variety of miscarriage.

In consequence of the difficulties opposed to the pulmonary actions of the mother, the absorption of the requisite quantity of oxygen to supply her own system, and the rapidly increasing demands of the child, is interfered with, so that one or both must necessarily fall into disease; as affecting the child, this is occasionally productive of its death; after which the actions of premature expulsion succeed to remove the dead mass from the uterus.

The various symptoms which have been described as preceding the death of the fœtus, are consequences of the deficient oxygenation affecting the maternal system.

It will be desirable to show that they will be the natural and necessary results of the assigned cause; or, in other words, that defect of oxygenation really takes place during pregnancy, and is then adequate to produce the effects which have been attributed to it.

The symptoms which accompany the whole course of the disease, as languor, syncope, and difficulty in breathing, are such as are referable to defective respiration, and are exactly similar to what, under the common occurrences of life, are known to ensue from imperfect supply of pure atmospheric air, as is instanced in the effects produced on the respiration, and the whole vital actions, by crowded or confined rooms.

The states of predisposition, which have been described, are such as are likely to give rise to defective oxygenation; as the general delicacy of the system, which will necessarily be accompanied by a correspondent debility in the vital functions; and in particular the contracted state of the thoracic cavity, impeding the actions of the respiratory organs, and preventing the reception of an ample quantity of the respired air into the bronchial cells, and which effect will be liable to be induced, whatever may be the source of such diminution of the cavity, whether deranged bony structure, or any other cause trenching upon it, and interrupting its function.

Nor should the necessity for the supply of two systems, instead of one, be overlooked.

The above positions appear to be beautifully illustrated by the effects which have been stated to be induced.

Thus we find the symptoms commence as the child makes progress, and requires supply, and to increase with its increasing growth, aggravated by every circumstance calculated to interfere with the free discharge of the respiratory function in the mother; at lengh the child ceases to live, and immediately, its demand for oxygen ceasing, the parental system again derives an adequate supply; the various symptoms of languor, syncope, &c. go off, and the general health and spirits are restored, until the succeeding actions of expulsion begin to manifest themselves.

More or less of the characteristic symptoms of this affection are experienced by pregnant women in general, when exposed to the exciting cause of impure air, particularly in advanced states of pregnancy, when a diminution is made in the cavity of the chest, by the pressure of the enlarged uterus on the diaphragm; even this pressure alone may be sufficient to induce imperfect respiration, and consequently defective oxygenation; an effect which is often experienced in kneeling at church, or by any other undue position capable of pressing the uterus towards the diaphragm. Can it be wondered at, then, that such causes should more certainly and powerfully affect those who, by constitution and structure, are predisposed to be operated upon by them?

Strong illustrations of the opinion will be found in the phenomena of various diseased states.

There are reasons to consider, that a defective oxygenation of the blood attends certain deranged states of the liver, as when it becomes enlarged in consequence of excessive and habitual potations.

It may be doubted whether this effect ought to be attributed to the pressure of the enlarged viscus upon the diaphragm, or to certain changes produced in the qualities of the blood, in consequence of the chemical constitution of the fluids imbibed, which contain largely the hydro-carburetted principles. The effects of this state, however produced, independent of the peculiar darkness of the blood, and livid countenance attending it, give rise to very correspondent symptoms to what have been attributed to deficient oxygenation attending pregnancy; at least as far as regards the general symptoms evidenced by high disposition to languor, faintness, and even syncope.

The above effects of hepatic disease upon the chemical qualities of the blood, appear to explain how diseased liver may, in some instances, become the cause of abortion, an occurrence which is by no means unfrequent.

But it is in the phenomena evidenced by phthisis pulmonalis, that the most decided confirmation of the point in question may be found.

This formidable disease is frequently connected with the same appearances of predisposition as have been assigned to the present variety of abortion, that is with a contracted chest, and delicate state of the frame, and is, moreover, generally accompanied by more or less loss of substance of the lungs themselves. It might hence be conceived that it would have a tendency, was the advanced principle correct, to aggravate or produce the symptoms of such kind of abortion; but this is not the case; on the contrary, any such tendency, if it does exist, is counteracted by a peculiar and extraordinary disposition in the pulmonary system to absorb or acquire larger quantities of the oxygenating principle than would be done under a state of health; as is evidenced by a variety of symptoms concomitant with consumption of the lungs, as, for instance, the florid colour of the blood, when abstracted from the veins, or discharged from the lungs, or any other part of the vascular system; by the hectic flush and febrile accessions which always accompany the disease; the redness of the tongue and nostrils, and various other phenomena.

In consequence of this hyper-oxygenated state of the system, notwithstanding the general capacity of the chest or surface of the absorbing structure of the lungs may be diminished, the consumptive female, when she becomes pregnant, is rarely found to miscarry; on the contrary, she goes through the process of utero-gestation in a manner even more favourable than women in health, suffering, upon the whole, far less of the common inconveniences of that state; and when parturition takes place, has generally a most favourable and propitious labour, at least so far as relates to its process.

What is remarkable in this case is, that as utero-gestation advances, the previous symptoms of disease become materially lessened, so that the patient gives an apparent promise of escaping the imminent danger with which she had so decidedly been threatened, by this truly formidable disease; the pulmonary affections diminish, and the febrile accessions and hectic disappear; the progress of the consumption is arrested, and she seems to recover her general strength. Sometimes this happy amendment may be permanent; but, alas! too generally it is evanescent; soon after delivery the whole alarming symptoms recur, and unless they are again arrested by a repetition of pregnancy, hasten on with accelerated steps to their fatal termination,

The nature of these remarkable effects of pregnancy appear to admit of an easy solution on the principles which have been advanced, and which they beautifully illustrate and confirm.

As the child increases in size, and consequently in its demand for the principle of oxygenation, the symptoms of pulmonary disease gradually diminish, the superabundant oxygen taken in by the system of the mother, being consumed in its support; there is here no defect; the supply afforded is fully adequate for two systems, and this double expenditure is productive of decided advantage to the previously overcharged system of the mother, and which has been in consequence suffering disease. But as soon as the demand of the second system ceases, as after parturition, the superabundant oxygen, again determined to the maternal system solely, is followed by the recurrence of the previous alarming symptoms, and the fatal result is eventually produced.

It was upon this principle that the late Dr. Beddoes conceived the possibility of curing pulmonary consumption, by diminishing the quantity of oxygen in the air respired, by mixing factitious carburetted gas with it, or by inclusion of the patient in an atmosphere rendered impure from having been previously breathed by the larger animals; the plan, however, unfortunately did not succeed according to the expectation of its ingenious author; nor indeed ought this failure to be wondered at, since the superfluity of oxygen which it has been thus proposed to prevent, is undoubtedly an effect of the morbid actions plan generally, and in particular to the avoidance of impure air.

If the symptoms are found to gain ground, so as to become sensibly aggravated, the following medical treatment is to be had recourse to.

The nitric acid, before directed, to be taken in the beverage, should be increased in quantity, and carried to as large doses as the stomach will bear, for instance from fifteen to thirty drops of the diluted preparation may be taken, three, four, five, or six times a day, in a glass of the coldest water.*

The nitric acid, taken with this intention, it is conceived, will tend to impart to the circulating system of the mother a portion of the abundant oxygen in its composition, and with which it is combined by little powerful chemical attractions. It is not intended to deny, that this explication rests in some measure upon hypothesis, or to advert to the chemical decompositions which take place in this fluid, when taken into the human stomach, and the manner in which these tend to produce the effect presumed, whether by an immediate absorption of oxygenous principle, or by changes produced in the contents of the chylopoietic viscera, or upon any other principle. We know little of the modus operandi of medicines, but there is reason to suppose that various chemical qualities are capable of being detached from them in the stomach, and becoming subsequently introduced into different parts of the system, as is instanced in the effects of turpentine, and the Prussic acid, and various other substances; in the same manner it is conceived, that oxygen may be separated from medicines with which it is largely or loosely combined, in such way as to produce its peculiar changes on the circulating sanguineous fluid.

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* In using the nitric acid in these frequent doses, it is of importance to guard the teeth from injury; on this account the mouth should be well washed out immediately after taking it; or what is better, the acid fluid may be sucked in through a glass tube contrived for that purpose, and by means of it carried to the back of the mouth, out of the reach of the teeth.

If this plan is found insufficient, and the symptoms continue, notwithstanding, to increase, more decided and permanent relief will be found from combining an additional portion of oxygen gas with the air respired. With this view, oxygen gas is to be mixed with atmospheric air, and inhaled by means of an oiled silk bag.* From one to two gallons of oxygen gas, mixed with four of atmospheric air, will form a dose which is to be inhaled two, three, or more times in the day, according to the state of the symptoms, and evident demand for it. It is admirable how much the languid, and almost fainting patient, will find herself revived and invigorated, under its use, the effect continuing for hours. By means of it, and the nitric acid combined, she may be kept in a state of comparative comfort, and the welfare of the child will be so far promoted, that it will in consequence survive the usual period of utero-gestation, and be eventually ushered into existence, with every favourable prospect of well doing.

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* For an account of the mode of procuring, and breathing, the oxygen gas, see Appendix.

It may be observed, as a point of some interest, that when abortion has once been prevented in this way, the liability to future recurrences in succeeding pregnancies will be lessened; less caution will be necessary generally; and a lesser quantity of oxygen will be required to keep the system in a proper state; even the use of the nitric acid solely may be sufficient, although the good effects will not be so marked, as relates to the invigoration of the patient, as when the oxygen gas is used.

There is a mode of practice too generally adopted in abortion, without any correct discrimination of its causes, which it will be proper to advert to, and which in the present case must be unpropitious; this is the use of the lancet. As the abortive actions, in the present instance, are dependant on a deficiency of the principle of oxygenation in the blood of the mother, to abstract that blood must evidently have a tendency to deprive the child of a portion of that principle, from the want of which it is already sustaining so much risk, and thus to impair still farther its vitality. The only view on which such a practice can here be of advantage, is as relieving states of congestion produced by the languid sanguineous circulation, for want of the stimulus of sufficient oxygen; but before resorting to it on this account, it will be desirable to be assured of the actual existence and situation of this congestion, and of the necessity of thus relieving it; and also, whether it would not be equally, or better, relieved by the prescribed plan of oxygenation; by opening the bowels, or any other means.

The following cases will illustrate the various points which have been above advanced.

Mrs. A—, 29 years of age, a lady of delicate habit, and with a flat chest, was the mother of one child, which was puny, weakly, and with difficulty reared. In five succeeding pregnancies she miscarried about the fourth month, notwithstanding a variety of the usual means, as bleeding, the cold bath, tonics, exercise, &c. suggested by medical men of the first eminence, had been used. Her miscarriages had always been preceded by similar symptoms to what will be presently detailed, occurring at the same period of pregnancy, when at length she felt a sense of unusual weight about the region of the pubis, at which time she conceived the child ceased to exist; after this the previous symptoms went off, and in a few weeks, the expulsion of the dead child took place, followed, but not preceded, by hæmorrhage.

She became again pregnant, and was seriously apprehensive of another disappointment, as she began to experience all the precursors of her former mishaps.

She was suffering, in particular, considerable languor; the countenance was pallid, and the breathing slightly oppressed; but she was free from sickness, nausea, and the more usual distressing symptoms of pregnancy.

The symptoms appearing to be the effect of a deficiency of oxygenating principle, she was directed to inspire two or three times a day, two gallons of oxygen gas, diluted with four of atmospheric air. As soon as she began to inspire this oxygenated air, she became sensible of a diminution of languor, and she afterwards found, that whenever she was fatigued from any exertion, it uniformly acted as a cordial, reviving, and invigorating her. Having to get the gas from the distance of six miles, from this cause, or some defect in the apparatus for procuring it, it occasionally happened that she was two or three days without it. In this interval she was always sensible of increased languor, which was speedily removed, on again using the oxygenated air.

In order, in some degree, to remedy this inconvenience, she was directed on such occasions to take twenty or thirty drops of dilute nitric acid in water, as a substitute; this, although it did not produce the full invigorating effect of the gas, sensibly relieved her.

This plan was persisted in until the end of the ninth month, when she was delivered of a fine, healthy, full-grown boy.

The same lady in a few months found herself again pregnant, and adopted the same mode of treatment. She became again the mother of a healthy boy.

After this she left England, and, according to the accounts of her friends, had other children at their full time, adopting the general plan, before laid down, but substituting the nitric acid entirely for the oxygen gas; she was however impressed with a conviction, that she suffered more from languor than she would have done had she used the latter.

Mrs. N—, a woman of a weakly scrophulous habit, after being affected with languor and shortness of breathing, followed by symptoms of the child having ceased to live, suffered premature labour, at the seventh month, in her two first pregnancies.

Becoming again in the family way, and the previous preceding symptoms beginning to make their appearance, about the fourth month, I was induced to consider the life of the child implicated from a want of oxygenating principle. As circumstances would not conveniently admit of the use of the oxygen gas, she was directed to take the nitric acid three or four times a day; to keep her bowels regular, and avoid exertion. She now went through her pregnancy properly, and in due time was delivered of a full-grown healthy child.

APPENDIX

TO THE ESSAY ON ABORTION.

On the mode of procuring and administering Oxygen Gas.

As the present Essay may get into the hands of those who may not be familiar with the manner of procuring and administering fictitious gases, I shall make no apology for subjoining to it a statement of an advantageous mode of effecting these points at least with respect to oxygen gas.

Oxygen gas is obtained readily, largely, and in a very pure state from the black oxyde of manganese, one ounce of which will yield about ninety cubic inches of gas; this is far the best way of procuring it for medical purposes. With this intention the oxyde is to be exposed in an iron retort to the red heat of a common culinary fire. (Fig. 11.) Fig. 1. represents an iron retort adapted for this purpose, in which the manganese, in coarse powder, is to be enclosed. To this retort must be connected a conducting tube (Fig. 10.) about four feet long, consisting of different parts or joints (Fig. 2, 3, 4, 5.) The joint (Fig. 2.) which attaches immediately to the retort is to be of wrought iron, that it may injure as little as possible from the action of the fire—the part (Fig. 3.) which connects with Fig. 2, as well as all the other parts, may be of brass or copper. Between parts (Fig. 3 & 5) is the moveable circular joint, (Fig. 4.) formed by two segments of a hollow sphere adapted to each other, the touching surfaces ground to fit correctly, and secured together by the nut or screw in the centre. The extremity (Fig. 5.) is bent in such manner as to admit of its being easily received into the inferior aperture *(a)* of the reservoir or air-holder. (Fig. 6.) When put together for use, the whole of the connexions formed by the above parts must, by means of ground joints, or lutes, be rendered perfectly air-tight. The retort being filled and introduced into the fire, the gas will soon be found issuing abundantly from the extremity of the tube.*

The next point is to collect the gas as it escapes from the tube.

Figure 6, is a cylindrical reservoir, or air-holder, made of strong tin, or copper, well soldered and japanned, so as to be completely air-tight, and capable of containing six gallons: it should possess considerable strength, to admit of its being transported from place to place, without injury; near to its bottom is an aperture *(a)*, with a short neck, or pipe, rising upwards and obliquely; in the upper end are two openings, to which necks are attached, the one communicating immediately with the internal cavity at its upper part; the other *(c)*, with the same at its lower part, by means of a tube running through the whole cavity, and marked in the figure by dotted lines. These openings should all admit of being closed, and rendered perfectly air tight, by means of ground stoppers, or corks, well secured by luting.

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* A portion of the oxygen contained in the manganese is here expelled by the increase of temperature, while another part remains behind in combination with the manganese, which is thus reduced to the state of a suboxyde. This suboxyde has a very powerful attraction for oxygen, which, on exposure to the air, it again absorbs largely, and is soon brought back to its fully oxydised state, and thus the same material admits of being used repeatedly.

The aperture *(a)* being closed, the reservoir is now to be filled with water by means of the funnel (Fig. 7,) introduced into the aperture *(c)*; the apertures *b* and *c* are next to be carefully closed, and *a* opened; if the machine is perfectly air-tight no water will escape from *a*, the pressure of the atmosphere on its oblique aperture being greater than that of the column of water within. The extremity of the conducting tube (Fig. 5,) being now introduced into the lower aperture *a*, the gas passes into the air-holder, and rising to the upper part of it, displaces a correspondent quantity of the fluid which escapes from *a*, and may be allowed to run off, or received into any convenient vessel. In time the whole water will thus be displaced, and the vessel filled with oxygen gas. After this the lower aperture is to be perfectly closed; the whole is then ready for use.

In order to prepare it for respiration, the gas must be transferred from the air-holder into an oiled silk bag, (Fig. 8,) capable of holding six gallons of air; this apparatus must be furnished with a pipe *(a)*, which will either fit into the aperture *(b)* of the air-holder, or serve the purpose of a mouth piece in breathing its contents. The aperture *(b)* of the reservoir being opened, the above pipe is to be inserted into it, and now unclosing the aperture *(c)*, a quantity of water equal to the quantity of oxygen intended to be used, as, for instance, one or two gallons, is to be poured in by means of the funnel; this will expel the air, through *b*, into the silk bag; the latter is now to be carefully removed, reclosing the various apertures of the air-holder; the pipe of the bag is next to be inserted into the nozzle *(a)* of the bellows (fig. 9), and which is expressly formed to receive it; and the bag filled with common air, by working the bellows. The oxygen gas is thus combined with the requisite quantity of common air, and ready to be breathed.

The bellows being removed, the air within the bag is to be prevented from escaping, by placing the end of the finger over the opening of the pipe, while the latter is conveyed into the mouth; the patient now commences breathing the air, continuing the process until the whole is exhausted.

To do this properly, a succession of moderate inspirations should be made, taking care to draw the air from the bag solely, and not through the nostrils.

from the external atmosphere; after retaining it a second or two in the lungs, it is to be expired, driving it back *through the nostrils only*, no part being allowed to return into the bag, which would render the remaining contents more or less impure.

The whole of the above-described apparatus may be procured ready for use at the various chemical apparatus shops, and particularly at the manufactory of the late Mr. Watts, at Soho, near Birmingham.

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DESCRIPTION OF THE PLATE.

Fig. 1. A wrought iron retort to contain the manganese.
2. An iron conducting tube, connected with the mouth of the retort *(a)* by its extremity *(a)*.
3. A copper tube about 18 inches long, connected with the iron tube at *(b)* by its extremity *(b)*.
4. A moveable joint piece (enlarged), connected to Fig. 3, at its end *(a)*, by its extremity *(a)*.
5. A copper tube connected to the moveable joint, Fig. 4, at *(b)*, by its extremity *(b)*. Its other extremity *(a)* is intended to be received into the aperture *(a)* of the reservoir, Fig. 6.
6. The reservoir, or air-holder, at *(a)*, an aperture to receive the extremity of the conducting tube, at *(b)* and *(c)* two other apertures.
7. A funnel fitting to the aperture *(a)* of the reservoir.
8. An oiled silk bag; at *(a)*, a pipe which fits into the aperture of the reservoir, and also into the nozzle *(a)* of the bellows, Fig. 9.
9. A pair of bellows; at *(a)*, an opening in the nozzle to receive the pipe *(a)* of the silk bag.

Fig. 6, 10 & 11, shew the principal parts of the above apparatus connected together and at work, to procure oxygen gas.